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EP 0919787 A1 WO 99/56144 A1 WO 98/59506 A2
JP 110272687 A JP 110072348 A JP 100013961 A
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(54) Abstract Title
Technique for distributing information within a wireless network based on location information

(57) System and method for distributing to a portable device 6 via a wireless network 30, information relating to a subject of interest based on a location of the portable device 6. The portable device 6 has a receiver 20 for receiving from a terrestrial positioning system 15 (e.g LORAN, GPS), signals specifying positional information for the device and is arranged to transmit to a server 8 over the wireless network 30, a query incorporating the positional information. The server 8 may then determine from the positional information an address for a block of information relating to a subject of interest associated with that positional information, whereby the block of information may be retrieved and transmitted to the portable device over the wireless network 30 or the address may be transmitted to the device to enable a user to request transmission of the block. Preferably, the blocks of information are provided on an Internet or Intranet 7, the query is in the form of a URL and the portable device is arranged to support a Web browser. To provide better accuracy when using a GPS positioning system, a differential GPS system may be used, where the portable device may receive error information from a differential GPS device 40 or via the server 8. The invention has uses in areas such as shopping centres, supermarkets, museums and leisure parks where the information of interest may relate respectively to nearby shops, special offers, exhibits and rides. There are provisions for tailoring and storing the information and for adapting a standard device for use a the portable device, e.g. a PCMCIA card with wireless LAN and GPS interfaces. May use HomeRF, Bluetooth, UMTS or Wireless LAN.

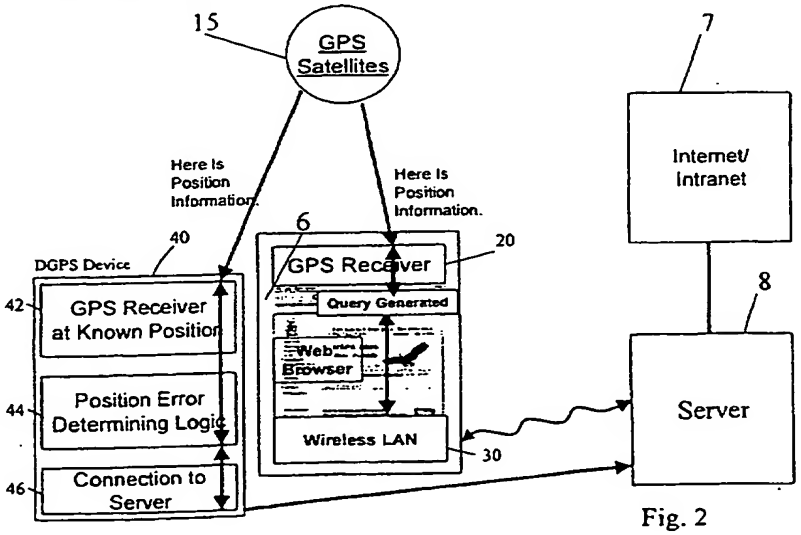

Fig. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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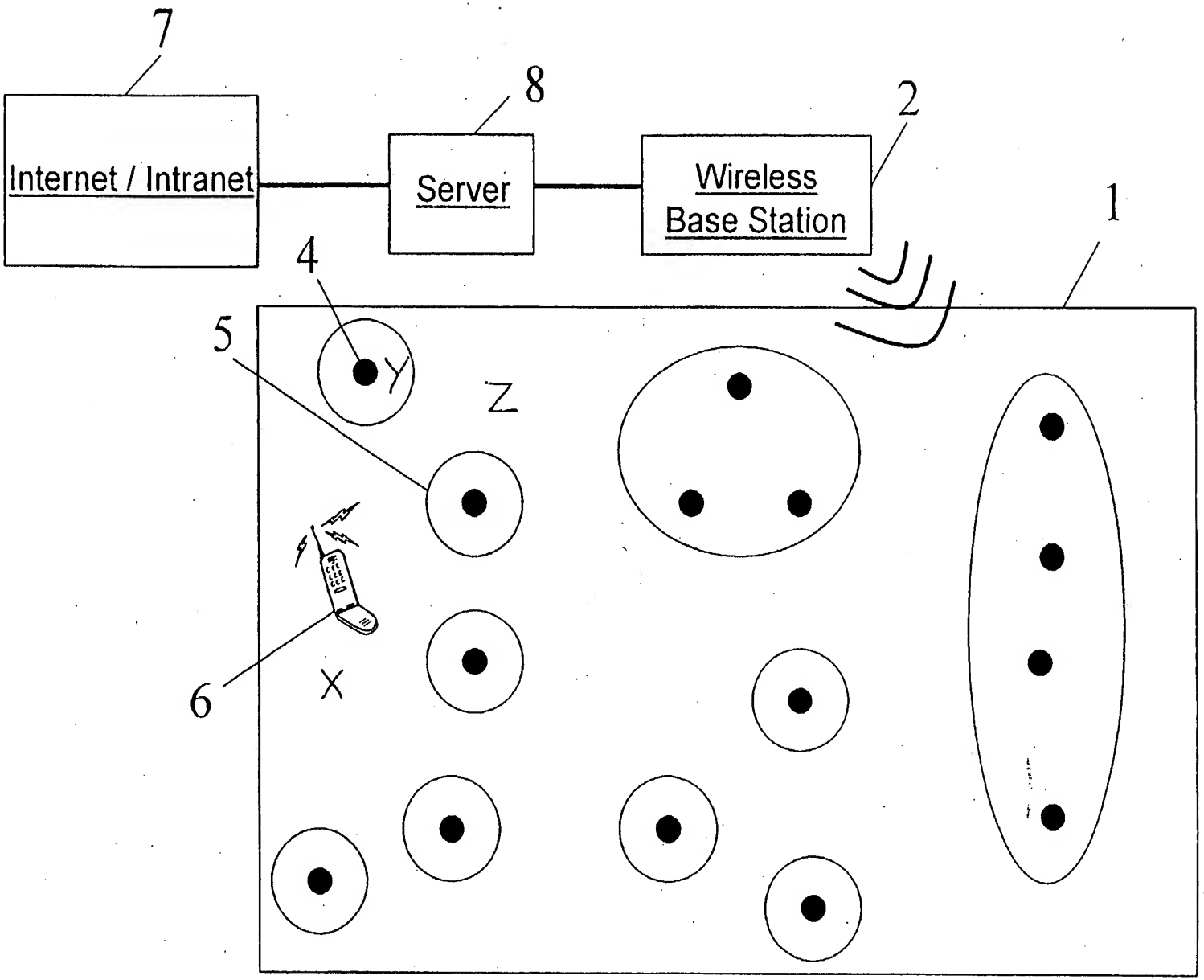
7
Internet / Intranet
8
Server
2
Wireless
Base Station
1
4
5
Y
Z
6
X

Fig. 1

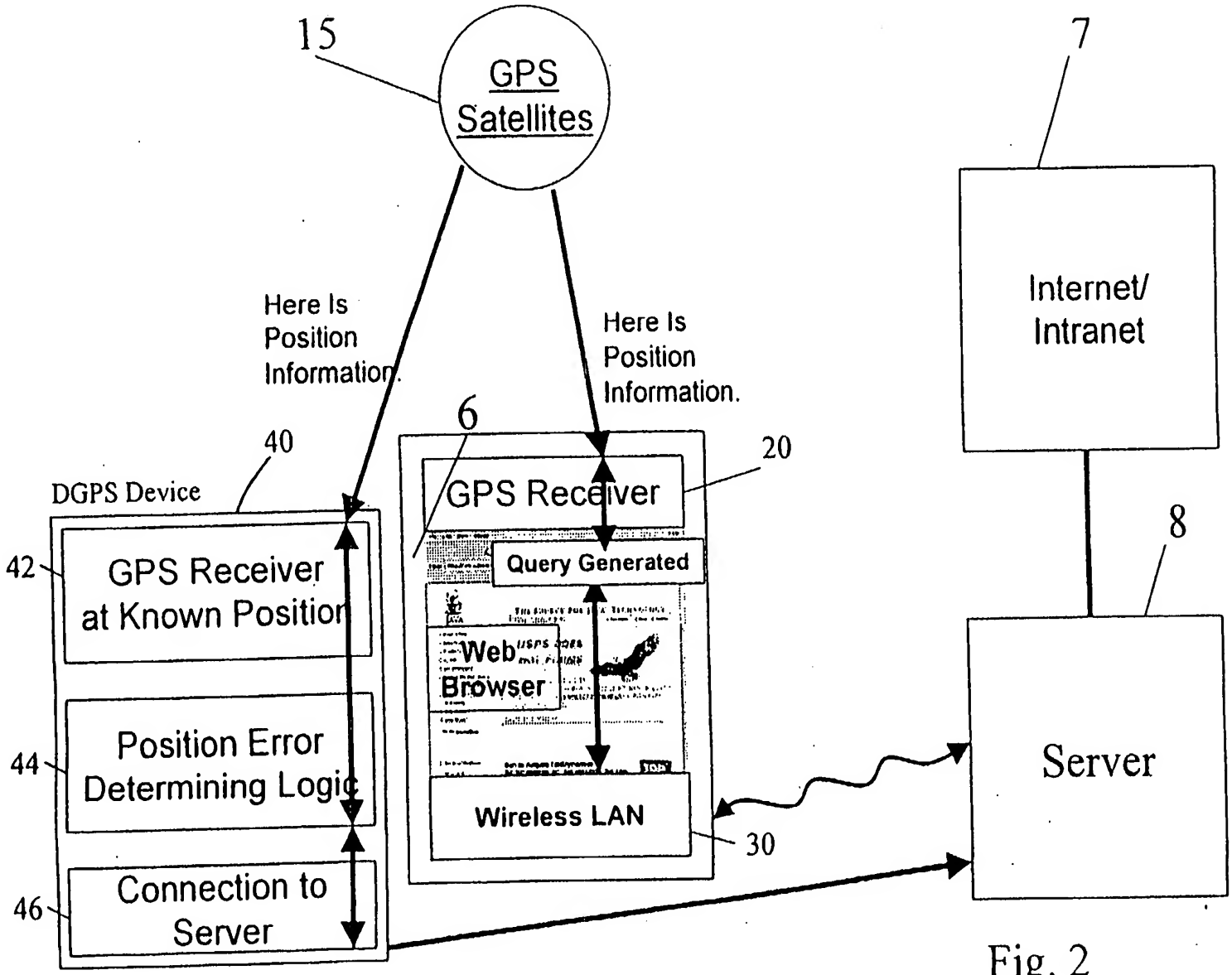
15
GPS Satellites
7
Internet/ Intranet
Here Is Position Information.
Here Is Position Information.
6
40
20
DGPS Device
GPS Receiver
Query Generated
42
GPS Receiver at Known Position
Web Browser
44
Position Error Determining Logic
Wireless LAN
30
8
Server
46
Connection to Server

Fig. 2

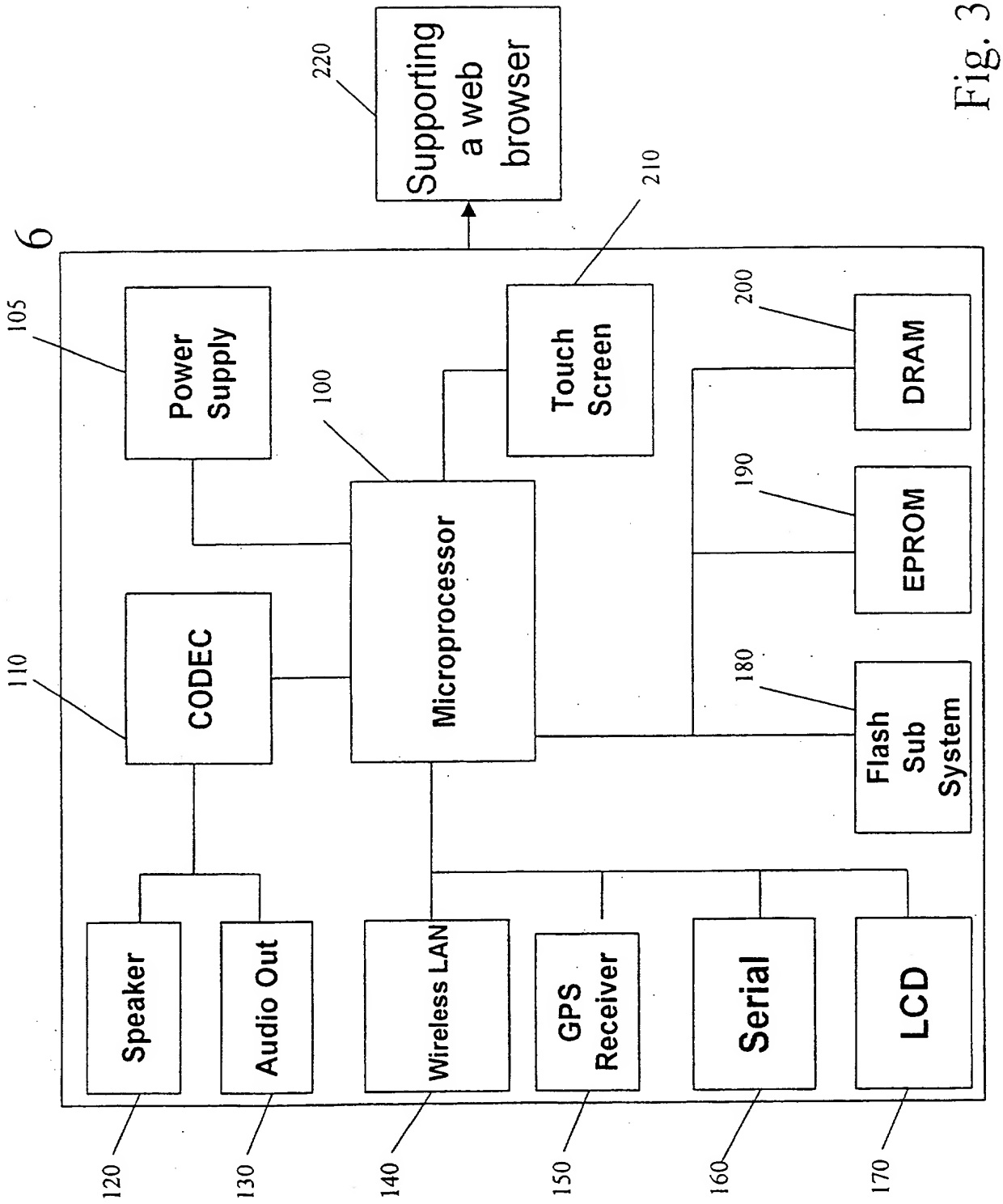
6
Supporting a web browser
220
210
105
Power Supply
100
Touch Screen
200
DRAM
190
EPROM
Microprocessor
110
CODEC
180
Flash Sub System
Speaker
Audio Out
Wireless LAN
GPS Receiver
Serial
LCD
120
130
140
150
160
170

Fig. 3

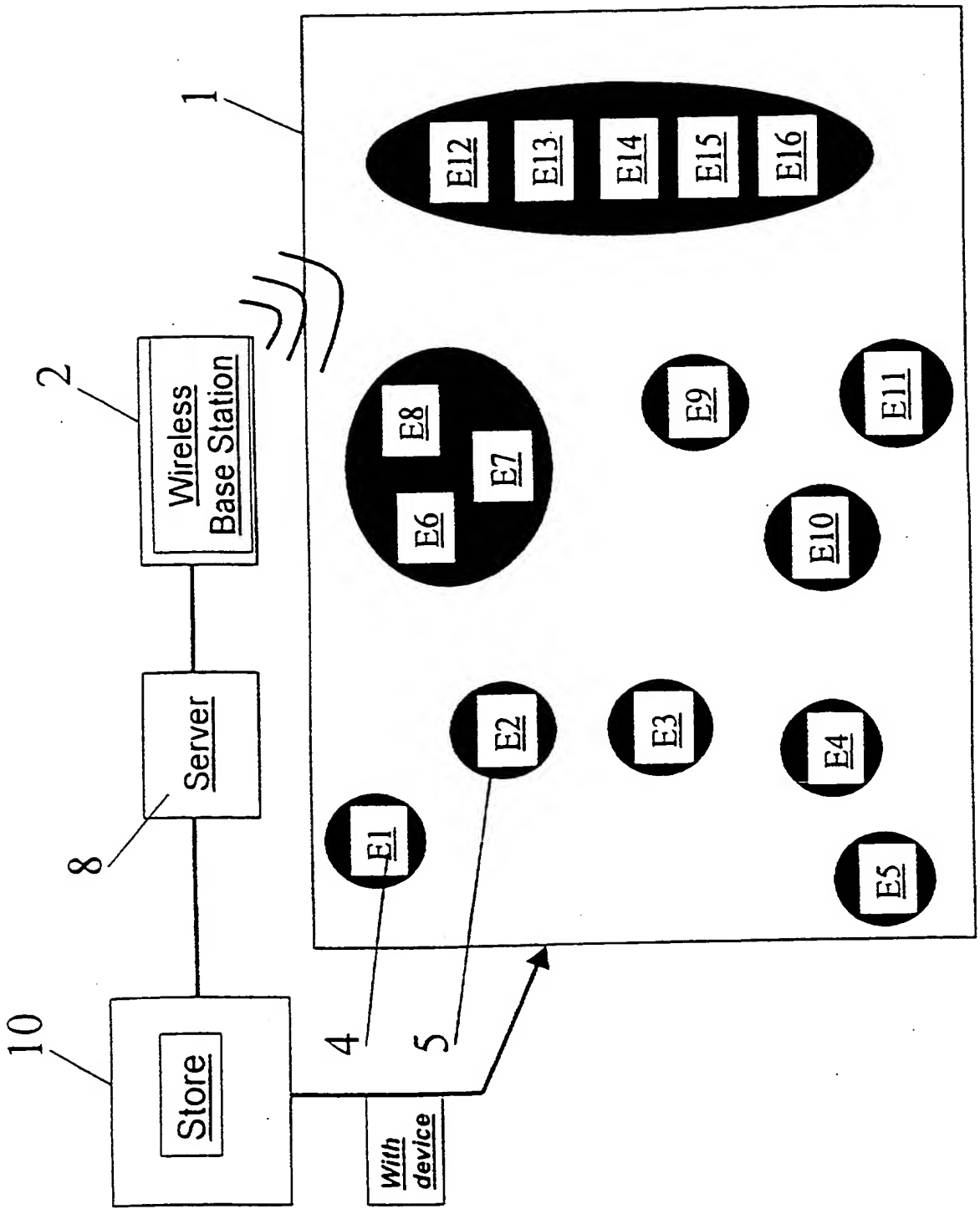
1
2
Wireless Base Station
Server
8
10
Store
With device
4
5
E1
E2
E3
E4
E5
E6
E7
E8
E9
E10
E11
E12
E13
E14
E15
E16

Fig. 4

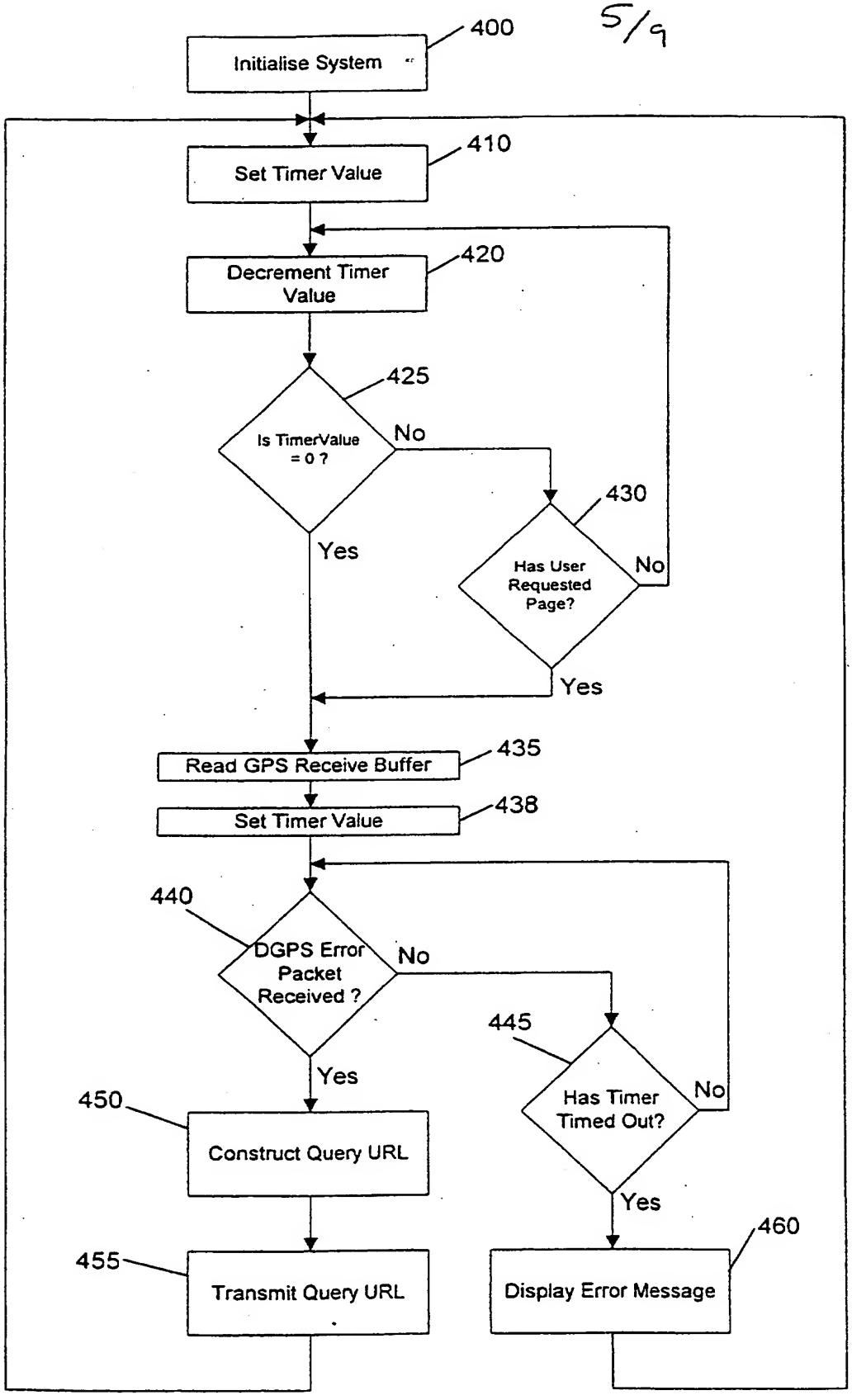
400
Initialise System
410
Set Timer Value
420
Decrement Timer Value
425
Is TimerValue = 0 ?
No
Yes
430
Has User Requested Page?
No
Yes
435
Read GPS Receive Buffer
438
Set Timer Value
440
DGPS Error Packet Received ?
No
Yes
445
Has Timer Timed Out?
No
Yes
450
Construct Query URL
455
Transmit Query URL
460
Display Error Message

FIG. 5

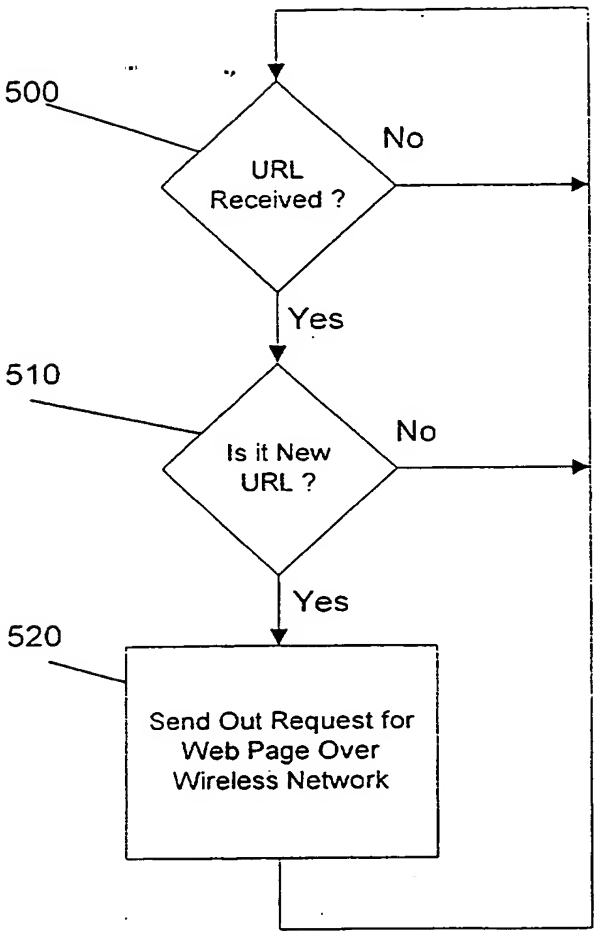
500
URL Received ?
No
Yes
510
Is it New URL ?
No
Yes
520
Send Out Request for Web Page Over Wireless Network

FIG. 6

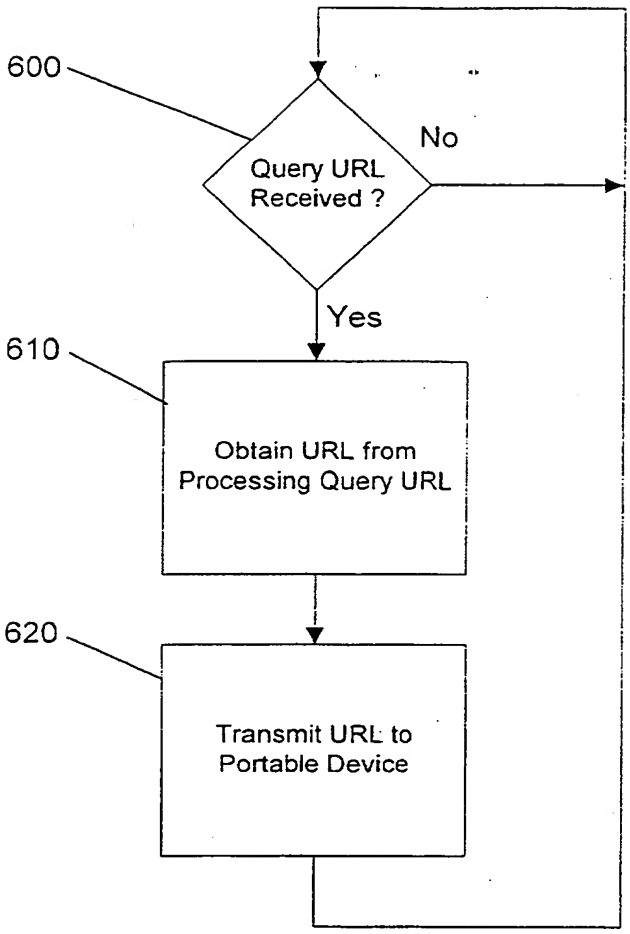
600
Query URL Received ?
No
Yes
610
Obtain URL from Processing Query URL
620
Transmit URL to Portable Device

Fig. 7

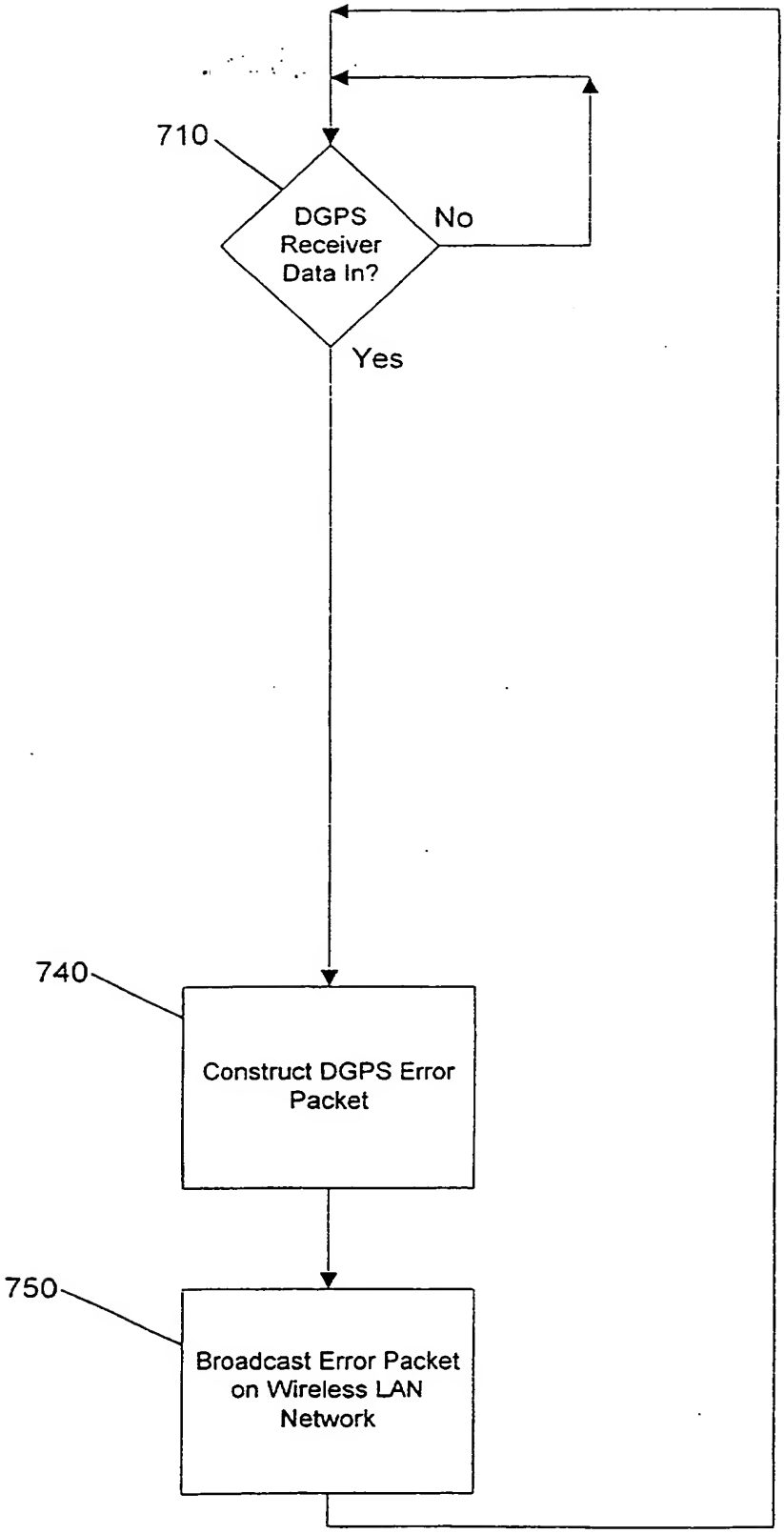
710
DGPS Receiver Data In?
No
Yes
740
Construct DGPS Error Packet
750
Broadcast Error Packet on Wireless LAN Network

FIG. 8

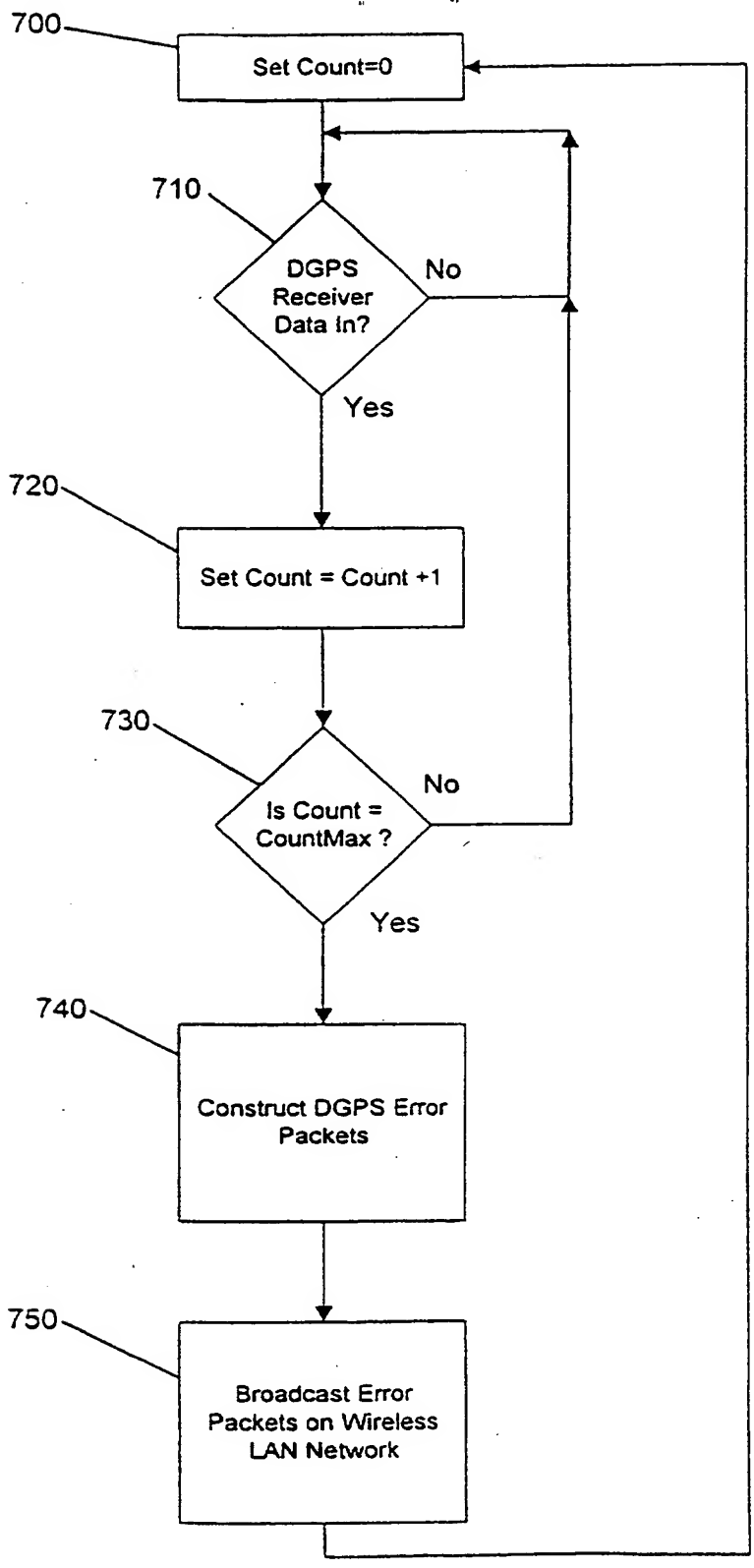
700
Set Count=0
710
DGPS Receiver Data In?
No
Yes
720
Set Count = Count +1
730
Is Count = CountMax ?
No
Yes
740
Construct DGPS Error Packets
750
Broadcast Error Packets on Wireless LAN Network

FIG. 9

A TECHNIQUE FOR DISTRIBUTING INFORMATION WITHIN A WIRELESS NETWORK BASED ON LOCATION

Field of the Invention

The present invention relates to a technique for distributing information within a wireless network based on location.

Description of the Prior Art

It is often desirable to distribute information to people, the content of the information being dependent on an individual's location. There are many different ways in which the dissemination of such information may currently be achieved.

For example, when in shops such as supermarkets or other large retail outlets, posters or other forms of presentation may be used to convey information to a person concerning particular special offers for products that that person is in the vicinity of. Considering another example, when in a museum, exhibition centre, leisure park, etc., a person may be provided with a leaflet providing general information about the place, and/or specific information about items to be found at particular locations within the museum, exhibition or leisure park. Alternatively, particularly for the example of a museum, exhibition or the like, the person may be able to hire some headphones, with details of particular items being provided via the headphones as that person passes through the museum or exhibition.

A yet further example occurs in town centres or shopping malls, where in an attempt to attract people into individual shops, retailers use various advertising techniques such as the use of banners, or the distribution of leaflets by staff, to entice people off the streets into their shops.

Whilst any of the above mentioned techniques may prove effective in particular situations, it is desirable to provide a more generic technique for distributing information to individuals based on location.

Summary of the Invention

According to a first aspect, the present invention provides a system for distributing to a portable device via a wireless network information relating to a

subject of interest based on a location of the portable device, comprising: a server for communicating with a portable device over the wireless network; a portable device having a receiver for receiving from a terrestrial positioning system signals specifying positional information for the portable device; the portable device being arranged to generate a query incorporating the positional information and to transmit the query to the server over the wireless network; and the server being arranged to determine from the positional information in the query an address for a block of information relating to a subject of interest associated with that positional information, whereby the block of information can be retrieved and transmitted to the portable device over the wireless network.

The development of wireless technologies is now at a stage where the network capacity allows data to be transferred at high speeds. Examples of wireless technologies which would support such data transfer are "HomeRF", a derivative of Digital Enhanced Cordless Technology (DECT), Bluetooth, UMTS, or Wireless LAN. These technologies allow high speed data transfer, for example UMTS would allow high bandwidth data transfer up to 2 Mbits/sec, whilst Wireless LAN would allow data transfer up to 11 Mbits/sec. Details of the HomeRF Shared Wireless Access Protocol (SWAP) can be obtained from the web page www.homerf.org. UMTS is the name given to the Third Generation Mobile Communication Standard covered by ETSI and ITU standards. Bluetooth is an ad hoc scatternet for affordable and highly functional wireless connectivity, and specifications of it can be obtained from the web page www.bluetooth.com. Wireless LAN is defined by IEEE standards, IEEE 802.11 and IEEE 802.11a, the latter being for high speed 11 Mbits per second interconnectivity.

Accordingly, it would be possible to distribute a large amount of information to individuals assuming those individuals had suitable portable devices for receiving that information over such a wireless network. The present invention takes advantage of these emerging technologies by utilising them within a system to enable information relating to a subject of interest to be distributed to a portable device based on its location. In accordance with the present invention, a server is provided for

communicating with a portable device over a wireless network. In preferred embodiments, this wireless network will be "pervasive", in that it will have a coverage area extending over the entire area, e.g. a shopping centre, a museum, a leisure park, etc., in which the system of the preferred embodiment is to be deployed. The wireless network coverage area may be serviced by a number of transmitters/receivers, each serving a portion of the coverage area.

In addition to the portable device being able to communicate with the server via the wireless network, the portable device is also able to receive from a terrestrial positioning system signals specifying positional information for the portable device. In preferred embodiments, this terrestrial positioning system will be one of a number of systems already existing. For example, one possibility is to use a radio location based system, such as Loran. Alternatively, a satellite-based system may be used, a well-known satellite-based system being the Global Positioning System, or GPS. The GPS system has a number of satellites in orbit which continuously transmit very precise timed radio signals. A GPS receiver will then receive these radio signals from several of the satellites, and will use the received signals to calculate the distance from each satellite to the receiver, which enables the position of the GPS receiver to be calculated.

It will however be appreciated that there is no requirement to use a known terrestrial positioning system in embodiments of the present invention, but instead a bespoke terrestrial positioning system may be provided for a particular deployment. For example, a museum, exhibition, leisure park, shopping centre, etc. may have a specific terrestrial positioning system provided for it, with the portable device using the signals provided by that terrestrial positioning system to determine positional information.

In accordance with the present invention, the portable device is arranged to generate a query incorporating the positional information and to transmit the query to the server. The server is arranged to extract that positional information from the query and to determine from the positional information an address for a block of information relating to a subject of interest associated with that positional information. As a result

of this, it is then possible for the block of information to be retrieved and transmitted to the portable device over the wireless network.

By this approach, it can been seen that emerging wireless technologies that support high speed data transfer can be used to deliver information relating to a subject of interest to a portable device based on its location since the actual information transmitted is dependent on a signal transmitted by the portable device itself based on positional information determined by that portable device from a terrestrial positioning system.

It will be appreciated that the blocks of information provided to the portable device can comprise any information which it is determined relate to a subject that may be of interest to a portable device at a particular location. Hence, for example, in a shopping centre, the portable device may receive a block of information providing general information about the shopping centre (here the shopping centre as a whole being the subject of interest), and/or when the portable device is in the locality of a particular shop, the block of information received by the portable device may provide details about that particular shop (the particular shop now being the subject of interest).

It will be appreciated that the server may be arranged to cause the block of information to be transmitted to the portable device as soon as the address for that block of information has been determined from the positional information. However, in preferred embodiments the server is arranged to transmit the address to the portable device, the portable device being arranged to apply predetermined criteria to determine whether to request the block of information identified by the address, and the server being arranged to be responsive to the portable device requesting the block of information to cause the block of information to be retrieved and transmitted to the portable device. It will be appreciated that far less data will typically be required to transmit the address to the portable device than would be required to transmit the entire block of information to the device. Hence, by the above approach, the portable device is able to determine whether it is appropriate to receive the block of information based on the address, and only if it is appropriate is the block of

information then provided over the wireless network to the portable device. Hence, this reduces unnecessary transfer of data over the wireless network between the server and the portable device, thereby enabling more of the bandwidth of the wireless network to be available for other functions.

It will be appreciated that the server may be connected to databases containing the required blocks of information via any number of wired or wireless networks. In preferred embodiments, the databases may be provided on an Intranet or Internet. In such embodiments, the query is preferably constructed as a URL query, the address is a URL address for an Internet web page, the portable device is arranged to support a web browser, and the server is arranged to transmit data to the portable device to enable the web page to be displayed via the web browser.

Hence, in preferred embodiments, the portable device constructs a standard query in the form of a URL, this standard query incorporating the positional information specified by the signals received from the terrestrial positioning system. In one embodiment, it is envisaged that the form of the standard query used by the portable device may be downloaded from the wireless network when the portable device first logs on to the network. Alternatively, the form of the standard query may be predetermined. Since a standard query is used, the server is then able to interpret the query URL, and recover the positional information from the query URL. For example, the server may be arranged to interpret the query URL using, for example, CGI scripts or Java applications in order to determine the address for a block of information associated with that positional information.

In some embodiments, it is possible for the terrestrial positioning system to send its signals via the wireless network used for communication between the server and the portable device. For example, if a bespoke terrestrial positioning system is developed that transmits signals using the same wireless technology as that used for communications between the server and the portable device, then it is clear that such a terrestrial positioning system could use the wireless network. However, in preferred embodiments, the portable device has an interface for communicating over the wireless network with the server via a first wireless communication, and the signals

from the terrestrial positioning system are arranged to be received by the receiver via a second wireless communication. In preferred embodiments, the wireless network is a Wireless LAN network supporting the transfer of data at high speeds, whilst the terrestrial positioning system makes use of a different wireless communication, such as a standard radio communication.

In preferred embodiments, the terrestrial positioning system is a Global Positioning System (GPS), and the receiver of the portable device is a GPS receiver arranged to determine the positional information from the received signals.

The basic resolution of GPS is somewhere in the region of +/- 100 metres, and in many embodiments this resolution may be perfectly acceptable. However, assuming a higher resolution is desired, then the terrestrial positioning system may include a differential GPS device arranged to receive the signals specifying positional information and to compare the positional information determined from those signals with an absolute position for said differential GPS device in order to generate error information. In such embodiments, the portable device would be arranged to receive the error information, and to use the error information to correct the positional information determined from the received signals prior to the generation of the query by the portable device. By this approach, more accurate positional information can be incorporated into the query generated by the portable device, thus giving the server more accurate positional information from which to determine an appropriate block of information to be made available to the portable device.

Known differential GPS devices typically use a dedicated RF link over which to broadcast the error information. The standard GPS receiver is then typically replaced by a differential GPS (DGPS) receiver having two interfaces, one to receive the signals from the GPS satellite, and one to receive the error information over the RF link from the differential GPS device. Given the added complexity of DGPS receivers, the use of such receivers within the portable device may significantly increase the cost and complexity of the portable device.

To alleviate this problem, in embodiments employing a differential GPS device, the server is preferably arranged to be coupled to the differential GPS device

to receive the error information generated by the differential GPS device, the server being arranged to generate an error packet containing the error information and to broadcast the error packet over the wireless network for receipt by the portable device.

By this approach, the portable device can retain a standard GPS receiver, and the positional information determined by the GPS receiver can then be corrected within the portable device based on the error information received over the wireless network prior to the generation of the query by the portable device. This significantly reduces the complexity of the portable device.

In preferred embodiments, the server is arranged to generate and transmit an error packet each time an item of error information is received. This avoids any unnecessary delay in the transmission of the error information to the portable devices.

The above approach is clearly appropriate if, for example, a dedicated channel within the wireless network is provided purely for that purpose. However, assuming that a dedicated channel is not available, and hence the transmission of such error packets has to compete with the transmission of other information over the network, then the server may alternatively be arranged to wait until a number of items of error information have been received from the differential GPS device, and to then broadcast in one batch a corresponding number of error packets over the wireless network. This enables more efficient use of the available bandwidth of the wireless network, since it is more efficient to transmit a number of error packets at the same time, rather than individually.

It will be appreciated that any appropriate coupling could be provided between the differential GPS device and the server, for example, the coupling could take place via a dedicated RF link or via a wired link. Further, it will be appreciated that the server could be arranged to perform the error packet generation process by execution of an appropriate computer program.

As mentioned previously, the wireless network may be any suitable network that facilitates the transfer of data at high enough speeds to allow the blocks of information to be readily transmitted to the portable device. In preferred embodiments, the wireless network is a Wireless LAN network.

It will be appreciated that there are a number of ways in which the server may determine addresses for blocks of information to be associated with particular items of positional information. However, in preferred embodiments, the system further comprises a lookup table accessible by the server, the lookup table containing a number of addresses for blocks of information, and each address being associated with a range of positional information. By this approach, a particular address for a block of information may be associated with an area rather than a specific location. Hence, for example, considering a shopping centre implementation, a URL address identifying a web page for a particular shop may be associated with any location within a certain range of that shop, such that when a user is within that range of the shop, he/she may be provided with that web page, either automatically, or as a result of the user requesting that a query be submitted to the server.

It is not essential that every possible item of positional information has an address associated therewith. Accordingly, in preferred embodiments, if the positional information determined by the server from the query is not associated with one of said addresses in the lookup table, the server is arranged to cause a signal to be transmitted to the portable device indicating that no block of information is available. This may, for example, be a suitable approach in any deployment where the person responsible for the system only wishes to provide information relating to particular items of interest, with there being areas where the user is not particularly close to any of those items of interest, and hence where it may not be appropriate to provide any blocks of information. Alternatively, a generic block of information may be provided when the user is in such areas, either the first time that the user moves into such an area, or each time the user moves into such an area, as appropriate.

The portable device may be arranged to generate a query at predetermined intervals, preferably this query being based on most recent positional information determined from the received signals. Alternatively, or in addition, the portable device may be arranged to generate a query when indicated by a user of the portable device, again the query preferably being based on the most recent positional information determined from the received signals.

Viewed from a second aspect, the present invention provides a portable device for receiving via a wireless network information relating to a subject of interest based on a location of the portable device, comprising: a controller for controlling the operation of the portable device; an output mechanism for outputting information to a user of the portable device; a receiver for receiving from a terrestrial positioning system signals specifying positional information for the portable device; the controller being arranged to generate a query incorporating the positional information and to cause the query to be transmitted to a server via the wireless network; and the controller further being arranged, upon receipt from the server via the wireless network of a block of information relating to a subject of interest associated with that positional information, to cause the information to be output to a user via the output mechanism.

In preferred embodiments, prior to receiving the block of information from the server, the portable device is arranged to receive from the server an address for the block of information and to apply predetermined criteria to determine whether to request the block of information identified by the address.

It will be appreciated that the predetermined criteria applied by the portable device may take any appropriate form. However, in preferred embodiments, the predetermined criteria is such that the portable device is arranged to request the block of information indicated by the address if the address differs to that of current information being output via the output mechanism. By this approach, it is ensured that bandwidth of the wireless network is not unnecessarily used to retrieve blocks of information already being output by the portable device.

In preferred embodiments, the output mechanism comprises a display device to enable the information to be visually displayed to the user.

Further, in preferred embodiments, the query is constructed as a URL query, the block of information relates to an Internet web page and the portable device is arranged to support a web browser, whereby the controller is arranged upon receipt of the block of information from the server to cause the web page to be displayed on the display device via the web browser.

Preferably, the portable device further comprises an input mechanism for enabling the user to interact with the portable device, whereby the user can indicate to the controller via the input mechanism that a query should be submitted to the server, the controller being responsive to such indication to generate a query based on the most recent positional information determined from the received signals.

Viewed from a third aspect, the present invention provides a method of distributing to a portable device within a wireless network information relating to a subject of interest based on a location of the portable device, a server being provided for communicating with a portable device over the wireless network, the method comprising the steps of: (i) receiving at the portable device from a terrestrial positioning system signals specifying positional information for the portable device; (ii) generating at the portable device a query incorporating the positional information; (iii) transmitting the query to the server over the wireless network; and (iv) determining at the server from the positional information in the query an address for a block of information relating to a subject of interest associated with that positional information; whereby the block of information can be retrieved and transmitted to the portable device over the wireless network.

Viewed from a fourth aspect, the present invention provides a method of operating a portable device to receive via a wireless network information relating to a subject of interest based on a location of the portable device, comprising the steps of: (i) receiving from a terrestrial positioning system signals specifying positional information for the portable device; (ii) generating a query incorporating the positional information; (iii) transmitting the query to a server via the wireless network; and (iv) upon receipt from the server via the wireless network of a block of information relating to a subject of interest associated with that positional information, outputting the information to a user via an output mechanism provided by the portable device.

Viewed from a fifth aspect, the present invention provides a computer program for operating a portable device to receive via a wireless network information relating to a subject of interest based on a location of the portable device, the computer

program being configurable in operation to cause the portable device to perform the steps of: (i) receiving from a terrestrial positioning system signals specifying positional information for the portable device; (ii) generating a query incorporating the positional information; (iii) transmitting the query to a server via the wireless network; and (iv) upon receipt from the server via the wireless network of a block of information relating to a subject of interest associated with that positional information, outputting the information to a user via an output mechanism provided by the portable device.

Viewed from a sixth aspect, the present invention provides a module for adapting a device for use as a portable device in a system according to the first aspect of the present invention, comprising: a receiver for receiving from a terrestrial positioning system signals specifying positional information for the portable device; and a wireless interface for communicating with the wireless network to enable a query incorporating the positional information to be transmitted to a server via the wireless network, and to enable receipt from the server via the wireless network of a block of information relating to a subject of interest associated with that positional information.

Brief Description of the Drawings

The present invention will be described further, by way of example only, with reference to preferred embodiments thereof as illustrated in the accompanying drawings, in which:

Figure 1 is a schematic illustration of a system in accordance with a first embodiment of the present invention;

Figure 2 is a diagram illustrating how information is retrieved in accordance with a preferred embodiment of the present invention;

Figure 3 is a block diagram of a portable device in accordance with a preferred embodiment of the present invention;

Figure 4 is a schematic illustration of a system in accordance with a second embodiment of the present invention;

Figure 5 is a flow diagram illustrating the process performed within the portable device to construct a query in accordance with preferred embodiments of the present invention;

Figure 6 is a flow diagram illustrating how a URL address is processed within the portable device of preferred embodiments of the present invention upon receipt from the server;

Figure 7 is a flow diagram illustrating how a query generated by the portable device is processed within the server in accordance with preferred embodiments of the present invention;

Figure 8 is a flow diagram illustrating how the server generates error packets based on received DGPS error information in accordance with one embodiment of the present invention; and

Figure 9 is a flow diagram illustrating how the server generates error packets based on received DGPS error information in accordance with another embodiment of the present invention.

Description of Preferred Embodiments

Figure 1 is a schematic illustration of a system in accordance with a first embodiment of the present invention. In accordance with this embodiment, a pervasive wireless network 1 such as Bluetooth, UMTS or Wireless LAN, is provided extending over an area in which the system of preferred embodiments is to be employed, e.g. a shopping centre, supermarket, leisure complex, etc. The wireless network 1 allows data to be transferred at high speeds, e.g. in the region of 2 Mbits/sec for UMTS, or 11 Mbits/sec for Wireless LAN.

In preferred embodiments of the present invention, a user of the system will be provided with a portable device 6 having the ability to support this high bandwidth of network 1, and being arranged to communicate over the wireless network 1 with a server 8 via a wireless base station 2. It will be appreciated that in certain embodiments the wireless base station 2 may be physically incorporated on the same device as the server 8, whilst in alternative embodiments, the wireless base station 2 may be an entirely

separate device to the server 8, with the server 8 being connected to the wireless base station 2 via any appropriate wired or wireless link.

The aim of the system in accordance with preferred embodiments of the present invention is to provide the portable device 6 with information relating to a subject of interest, with the subject of interest being dependent upon the actual location of the portable device. The subjects of interest will typically be predetermined, and may be anything that it is deemed suitable to inform a user of a portable device about when that portable device is at a particular location. Hence, with reference to Figure 1, a number of items 4 may be located within the area covered by the system of preferred embodiments, and these items may be determined to be subjects of interest. For example, in a shopping centre, the items 4 may be individual shops about which it is desired to distribute information, in a supermarket, the items 4 may be particular products which the supermarket wishes to promote, whilst in a leisure complex, the items 4 may be particular attractions and/or rides located within the leisure complex.

When the subject of interest is a particular item 4, then in preferred embodiments, a predetermined region 5 will be associated with each item, such that when the portable device 6 is within a region associated with a particular item, for example when the portable device is at location Y, the information relating to that subject of interest will be made available to the portable device 6.

As well as information relating to specific items, it will also be appreciated that it may be desirable to distribute more general information to the portable device 6. For example, with reference to Figure 1, and assuming that the area covered by the wireless network 1 is a leisure park, then when a user is at a location "X", it may be considered appropriate to provide general information about the leisure park to the portable device 6. Then, if a user subsequently moves to a location "Y" which falls within a region 5 associated with a particular attraction 4, then the system of preferred embodiments will make available to the portable device specific information relating to that attraction 4. If the user then subsequently moves from position Y to position Z, where the portable device is no longer within a region 5, then the system may be arranged to re-distribute

the general information provided when the user was at position X, or alternatively may determine not to provide any information at this point.

To enable the portable device's location to be determined, the portable device 6 is preferably provided with a receiver for receiving from a terrestrial positioning system signals specifying positional information for the portable device. As mentioned earlier, the terrestrial positioning system may be one of a number of known positioning systems, or alternatively a bespoke terrestrial positioning system may be provided for a particular deployment of the system. In preferred embodiments, the terrestrial positioning system is a GPS system, and the portable device 6 contains a GPS receiver for determining from signals received from a number of GPS satellites positional information for the GPS receiver. This positional information can be considered as a code, and will typically provide longitude, latitude, and also possibly altitude information, identifying the location of the GPS receiver, and hence the portable device 6.

Typically, GPS satellites send signals many times a second, and accordingly the GPS receiver within the portable device 6 will generate many items of positional information, or "codes", each second. These codes are typically stored in a buffer until such time as it is determined to generate a query for information. As will be discussed in more detail later, such queries may be generated on a periodic basis, and/or may be generated when indicated by the user of the portable device. Whichever approach is taken, the portable device will typically base the query on the most recent code generated by the GPS receiver, and accordingly only the most recent code need be retained in the buffer in those embodiments.

However, in certain embodiments, a number of previous codes may be stored in the buffer to provide a choice of codes upon which to base the query. For example, as will be discussed later, the portable device may wish to apply a correction to the positional information based on error information generated at particular points in time. If the error information is only generated relatively infrequently, then by storing a number of recent codes in the buffer, the portable device can choose a code that was generated at the same time as the error information (e.g. a code generated using the same satellite signals as those used to generate the error information).

In preferred embodiments, the portable device constructs a standard query which incorporates the code determined by the GPS receiver. The form of this standard query may be downloaded from the wireless network when the portable device first logs on to the network, or alternatively the form of the standard query may be predetermined.

Once the query has been generated by the portable device it is transmitted by the portable device to the server 8 via the wireless base station 2. In preferred embodiments, the server 8 is networked to Internet or Intranet 7 upon which the information resides.

The server 8 is arranged to extract the code from the query, and to then access a lookup table containing a number of addresses for blocks of information, each address being associated with either an individual position, or a range of positions. Hence, the server 8 can use the code to determine a corresponding address identified in the lookup table. By associating an address with a range of positions, a particular address for a block of information may be associated with an area rather than a specific location.

Based on the determined address, the server 8 may then directly cause the corresponding information to be retrieved from the Internet/Intranet 7, and transmitted back to the portable device 6. Alternatively, as a preliminary step, the server 8 may cause the address to be transmitted back to the portable device 6, and the portable device 6 can be arranged to apply predetermined criteria to determine whether it is appropriate to retrieve the information associated with that address. This is the approach used in preferred embodiments, since it avoids any unnecessary transmission of the block of information over the wireless network 1, and hence makes more efficient use of the available bandwidth of the wireless network 1. This process will be discussed in more detail later.

When a block of information is transmitted to the portable device 6, the portable device 6 is then arranged to output that information to the user via an appropriate interface. In preferred embodiments, the portable device includes a display area, and the information is displayed visually to the user, either with or without associated sound. Given the current proliferation of the World Wide Web (WWW), the information associated with subjects of interest are preferably provided by web pages on the Internet,

and the portable device 6 is arranged to support a web browser, such that web pages can be displayed to the user, these web pages being downloaded from the server 8 based on the positional information codes generated by the GPS receiver within the portable device 6.

As mentioned earlier, in the system illustrated in Figure 1, the pervasive wireless network 1 may cover a large building such as a supermarket or a shopping centre, with the subjects of interest being particular shopping aisles or goods within the supermarket, or particular shops, etc., within the shopping centre. Hence, considering the supermarket example, as the user moves around the supermarket, the user can be provided via the portable device 6 with up-to-date information about special offers for particular goods or any other marketing information which the supermarket owner may wish to disseminate. Similarly, within the shopping centre environment, as the user moves through the shopping centre, the portable device 6 may be arranged to automatically pick up advertising information for particular shops which the user is in the vicinity of.

An alternative embodiment of the system is illustrated in Figure 4, where in this case the building is a museum, and the subjects of interest are exhibits within the museum. Firstly, a user will go to a store 10, which acts as a collection point for portable devices. The devices are activated for a particular user, and as the user then walks into the gallery, he/she is faced with a number of exhibits 4. In a similar fashion to that described earlier with reference to Figure 1, locations within a predetermined range 5 of each exhibit 4 will be associated with addresses for particular blocks of information, for example via a suitable look up table as described earlier. Hence, when the portable device moves within the range 5 of a particular exhibit 4, and issues a query to the server 8 via the wireless base station 2, the server 8 will determine that the portable device is within the range 5, and will accordingly return the address for the block of information associated with that exhibit. Assuming the user chooses to receive that information, the information is then retrieved via the server 8, and transmitted back to the portable device over the pervasive network, to allow the information to be displayed to the user. In preferred embodiments, each portable device displays

information in the form of a web browser, with the web page information being transmitted over the high capacity pervasive network 1.

By this approach, it will be appreciated that the information on the portable device can be updated as the user moves between the various exhibits in the museum, since as the user moves within range of a new exhibit, its positional information will be continuously updated, and hence any query submitted based on the updated positional information will enable the appropriate new web page to be downloaded.

Hence, it will be appreciated that the above system makes use of a simple web authored database of information, which can be accessed based on positional information, or "codes", generated by the portable device based on signals received from a terrestrial positioning system, preferably a GPS system. An allocated web site that exists on the Internet or Intranet may be accessed and updated from the main server 8, and in preferred embodiments a web site is responsible for delivering information as users move between different subjects of interest.

It will be appreciated that the portable devices of either the Figure 1 or Figure 4 embodiment may take a variety of forms. In preferred embodiments, each device has an LCD on which information regarding the subject of interest is displayed in the form of a web browsing interface. The user can scroll through information and move forward and backward to links to find out more information. Further, in preferred embodiments, the device has the ability to save key information that the user wishes to keep. It would then be possible for the user to subsequently print the information, download the information as a data file, or e-mail the information to a desired e-mail address.

As an additional feature, some initialisation software could be provided on the device such that when the device is collected from the store, the user is asked to complete a questionnaire or the like asking for particular information. Hence, for example, the user may be asked to specify which language is to be adopted, specify the user's age, etc., and this information can then be transmitted to the server 8 to ensure that the information retrieved by the server 8 based on queries from that portable device is tailored to the user's individual needs. Hence, for example, children of a certain age

group could be provided with information more suitable to their learning and age range, whilst adults could be presented with more detailed information.

In the embodiment illustrated in Figure 4, the store 10 can be used as a central management point. The store would preferably take the form of a kiosk or information desk. On individual or party (for example a school visit) arrival, portable devices in the form of a hand held device could be hired, for example, for a small fee. Each device would preferably contain a security tagging system so that the device could not be removed from the premises. In preferred embodiments each device is fitted with a save mechanism which allows links, images, etc. either to be saved on the device or to a nominated server via the wireless communication link 1. Once the device is returned to the store 10, the links can then be downloaded to a printer for hard copy information, or sent via e-mail to the address of the user's choice from the store. If desired, a fee could be charged depending on the size of information saved, sent or printed.

The mechanism used in preferred embodiments to generate queries to be sent to the server 8 will now be described in more detail with reference to Figure 2. In the embodiment illustrated in Figure 2, GPS satellites 15 are arranged to broadcast signals which are then received by a GPS receiver 20 within the portable device 6. Using standard techniques, the GPS receiver is arranged to determine from the received signals positional information relating to the position of the portable device 6. As discussed earlier, either at predetermined intervals, or when indicated by a user, the portable device 6 is arranged to generate a query based on the positional information determined by the GPS receiver, and this query is then transmitted via the Wireless LAN interface 30 of the portable device 6 to a server 8. The server 8 is then able to determine, for example with reference to a look up table, an address associated with the positional information in the query, and to cause that address and/or the block of information at that address to be transmitted back to the portable device 6 over the wireless network 1.

The basic resolution of GPS is somewhere in the region of +/- 100 metres, and in many embodiments this resolution may be perfectly acceptable. However, assuming a higher resolution is desired, then the terrestrial positioning system may include a differential GPS (DGPS) device 40 arranged to receive from the satellites 15 the signals

specifying positional information and to compare the positional information determined from those signals with an absolute position for the DGPS device 40 in order to generate error information. More particularly, with reference to Figure 2, the DGPS device 40 will have a GPS receiver 42 arranged to receive the signals from the GPS satellites 15, and to determine positional information based on the received signals. This positional information is then passed to a position error determining logic 44 within the DGPS device which compares the positional information generated by the GPS receiver with absolute positional information stored within the DGPS device giving an indication of the absolute position of the DGPS device. This results in the generation of error information which may then be broadcast to GPS receivers to enable them to perform some error correction when generating the positional information from the signals received from the GPS satellites. It is well-known to use DGPS devices of the above type in standard GPS applications, and typically the error information generated by the DGPS devices is broadcast over a dedicated RF link for reception by GPS receivers. The standard GPS receiver is then typically replaced by a DGPS receiver having two interfaces, one to receive the signals from the GPS satellites, and one to receive the error information over the RF link from the DGPS device. Given the requirements of the two separate interfaces, and the need for the DGPS receiver to incorporate the error information into the process for calculating positional information, it will be appreciated that DGPS receivers are significantly more complex than standard GPS receivers.

In preferred embodiments of the present invention, a new approach is taken for the routing of the error information generated by the DGPS device 40, which removes the requirement for the portable device 6 to be equipped with a DGPS receiver, and instead only a standard GPS receiver 20 is required within the portable device 6. In accordance with this preferred embodiment, the DGPS device 40 is provided with a mechanism 46 for enabling the DGPS device 40 to be connected to the server 8. The link between the DGPS device 40 and the server 8 may take a variety of forms, for example a wired link may be used, or alternatively a dedicated RF wireless may be used. By this approach, the error information generated by the DGPS device 40 is passed to the server 8, rather than being broadcast directly to the portable device 6.

As will be discussed in more detail later, the server is arranged to generate an error packet containing the error information received from the DGPS device 40, and to broadcast the error packet over the wireless network for receipt by the Wireless LAN interface 30 of portable devices 6. The processor within the portable device 6 is then able to receive the positional information generated by the GPS receiver 20, and to apply correction to that positional information based on the error information within the error packet transmitted from the server 8. Preferably, time stamp information is associated with each item of positional information generated by the GPS receiver 20, and each item of error information contained within error packets from the server 8 (for example the time stamp may identify the actual GPS satellite signals used to generate the item of positional information or error information). Accordingly, this enables the processor within the portable device 6 to correct an item of positional information generated by the GPS receiver 20 based on error information generated at approximately the same time (preferably from the same satellite signals) as that item of positional information.

Once the positional information has been corrected based on the error information within the error packet from the server 8, then the portable device 6 is arranged to generate a query based on that corrected positional information, and to transmit that query to the server 8 via the wireless network. The process then proceeds as discussed earlier with reference to Figures 1 to 4, with the address associated with the positional information in the query being determined, and the associated block of information being retrieved from the Internet/Intranet 7 if required by the portable device 6.

Figure 3 is a block diagram illustrating the main components of the portable device 60 of preferred embodiments of the present invention. Portable device 60 contains a microprocessor 100 for performing the key processing operations of the portable device. Power supply 105, such as a rechargeable battery, is used to provide the power required by the microprocessor 100 to operate the portable device. A touch screen 210 is provided to enable a user to interact with the portable device, so as to enable responses to particular questions to be made, and to enable the user to browse through the web information provided. Further, a speaker 120 and/or an audio output

port 130 to enable external headphones to be fitted, are provided, such that audio signals generated by a CODEC 110 can be output to the user.

The portable device 60 has two interfaces, the first being in preferred embodiments a Wireless LAN interface 140 to enable the portable device to communicate via the pervasive network 1 with the wireless base station 2. Further, in preferred embodiments, the second interface is a GPS receiver 150 to enable the portable device to receive signals from GPS satellites used to determine positional information for the portable device.

In preferred embodiments, the web pages are displayed on a LCD display 170, the touch screen 210 being located on the LCD display. Further, a serial port 160 is preferably provided to enable information stored on the portable device to be down loaded at a suitable point.

As illustrated in Figure 3, the portable device 6 is also arranged to support a web browser 220 to facilitate the retrieval of web pages based on URL addresses.

In addition, the portable device 60 contains various memories for storing both the code executed on the microprocessor 100 and the information retrieved, including particular items of information saved by the user. In preferred embodiments, these memories take the form of flash subsystem 180, an EPROM 190 and DRAM 200. Typically, the default boot code is located in the EPROM 190, the flash subsystem 180 is configured with a file management system and provides caching for the web browser, and the DRAM 200 is used for executing the applications.

It will be appreciated that a specific portable device may be produced having the features illustrated in Figure 3, or alternatively a standard portable device may be adapted by providing suitable additional functionality for the standard portable device. For example, a standard portable device 6 may have a slot for a PCMCIA card, and the Wireless LAN interface 140 and GPS receiver interface 150 may be provided on a PCMCIA card for insertion into the portable device 6 to enable that portable device to be adapted for use in the system of preferred embodiments of the present invention. It will be appreciated that other features may also be provided on the PCMCIA card, for example extra memory, processing power, the serial port 160, etc., the exact features

required by the PCMCIA card being dependent on the functionality already provided within the standard portable device.

Figure 5 is a flow diagram illustrating the basic operation of the portable device used to generate a query URL in accordance with preferred embodiments of the present invention. It will be appreciated that this process may be implemented by a suitable software thread executing on the microprocessor 100 within the portable device 6.

The process starts at step 400, where the system is initialised. At this point, the wireless interface would be initialised, transmit and receive buffers would be created, etc. At step 410, a timer value is then set to a predetermined value, and at step 420, the timer value is decremented. Then, at step 425 it is determined whether the timer value is zero. If so, the process proceeds to step 435 to initiate the generation of a query URL. However, if the timer value is not zero, then the process proceeds to step 430, where it is checked whether the user has requested a page of information. If the user has requested a page, for example by entering an appropriate command via the touch screen 210, then the process again proceeds to step 435 to initiate the transmission of a query URL. However, if the user has not requested a page, then the process returns to step 420, where the timer value is decremented again. By this approach, it will be appreciated that either after a predetermined time has elapsed, or if the user actively requests a page, the process will proceed to step 435 to initiate the generation of a query URL.

More specifically, at step 435, the GPS receive buffer is read to determine the most recent item of positional information generated by the GPS receiver 150 of the portable device 6. With reference to Figure 3, the GPS receive buffer may be provided within DRAM 200, with the items of positional information generated by the GPS receiver being routed into the GPS receive buffer within the DRAM 200. As mentioned earlier, in preferred embodiments only the most recent item of positional information is retained in the GPS receive buffer.

Once the GPS receive buffer has been read, and the most recent item of positional information has been determined, the process proceeds to step 438, where a timer is set, after which the process proceeds to step 440, where it is determined whether an appropriate DGPS error packet has been received from the server 8 over the wireless

network 1, preferably the appropriate DGPS error packet being one containing error information generated using the same set of satellite signals used to generate the positional information retrieved at step 435. If not, the process proceeds to step 445, where it is determined whether a timer has timed out. If the timer has not yet timed out, then the process returns to step 440, to await the appropriate DGPS error packet from the server, whilst if the timer has timed out, then the process proceeds to step 460, where an error message is displayed on the portable device.

In this embodiment, it is assumed that DGPS error information is required in order to enable a query based on sufficiently accurate positional information to be generated, and accordingly if the DGPS error packet is not received after a predetermined time, this indicates that there is some error in the system. Accordingly the user would be notified of such an error at step 460, whereafter the process would return to step 410. The user may then take appropriate action, for example the user may choose to resubmit a query by entry of an appropriate command, such a command being detected at step 430. The process would then proceed to step 435, where a query would then be generated based on the most recent item of positional information in the GPS receive buffer.

Of course, it will be appreciated that, if DGPS error correction is not required, then steps 440, 445 and 460 would be omitted, such that the process proceeds directly to step 450 from step 435.

Prior to discussing the action taken by the portable device upon receipt of an error packet at step 440, the generation of error packets by the server will be discussed in more detail with reference to Figures 8 and 9, which are a flow diagrams illustrating two alternative processes that may be performed within the server to process received error information from a DGPS device. These processes may be implemented as a software thread executing within the server.

With reference first to the process of Figure 8, at step 710 it is determined whether error data has been received from the DGPS receiver within the DGPS device 40. If not, the process remains at step 710, until an item of error information has been received. Then the process proceeds to step 740, where the server generates a DGPS

error packet to represent the items of error information received by the server. The error packet would contain all of the original error information, including details of when the error information was generated (preferably by reference to the satellite signals used to generate the error information), but would be formatted appropriately by the server to facilitate its transmission over the Wireless LAN network.

Once the error packet has been constructed at step 740, then it is broadcast on the Wireless LAN network at step 750, whereby it can be received by the Wireless LAN interface 140 within each portable device 6. Once the error packet has been broadcast, the process returns to step 710, where the server waits for receipt of a subsequent item of error information.

As an alternative to the figure 8 approach where error packets are generated and broadcast as soon as each item of error information is received by the server, a batch approach as illustrated in Figure 9 could be used. In accordance with the Figure 9 approach, the process begins at step 700, where a parameter "Count" is set equal to zero, and then at step 710 it is determined whether error data has been received from the DGPS receiver within the DGPS device 40. If not, the process remains at step 710, until an item of error information has been received, at which point that item of error information is buffered within the server, and the process proceeds to step 720, where the parameter Count is incremented by one. Then, at step 730, it is determined whether the parameter Count is equal to a predetermined threshold "CountMax", and if not the process returns to step 710 to await receipt of further items of error information from the DGPS device.

However, when it is determined at step 730 that Count does equal CountMax, then the process proceeds to step 740, where the server generates a number of DGPS error packets to represent the items of error information received by the server. In preferred embodiments, an error packet is generated for each item of error information received, and as discussed with reference to Figure 8, each error packet contains the corresponding item of error information formatted for transmission over the Wireless LAN network.

Once the error packets have been constructed at step 740, then they are broadcast on the Wireless LAN network at step 750, whereby they can be received by the Wireless LAN interface 140 within each portable device 6. Once the error packets have been broadcast, the process returns to step 700, where the parameter Count is reset to zero.

For both the Figure 8 and Figure 9 approach, it is assumed that the DGPS device generates items of error information at the same frequency as items of positional information are generated by the GPS receiver of the portable device (e.g. preferably each time a set of satellite signals are broadcast by the GPS system). Further, it is assumed that the server generates an error packet for each item of error information received. Accordingly, at step 440 in Figure 5, the portable device should receive an error packet containing error information generated using the same set of satellite signals used to generate the positional information to be used for the query.

If, however, an embodiment were provided in which error information were generated less frequently than positional information, and/or the server were arranged to only transmit a portion of the total items of error information received, then the portable device may not always receive an error packet containing error information generated at the same time as the most recent item of positional information. Hence, in such embodiments, it may be appropriate for the GPS receive buffer to store a number of items of positional information, and for received error packets to be compared with the items of positional information in the GPS receive buffer to identify the most recent item of positional information that does have a corresponding item of error information available, that item of positional information then being used for the query.

However, in preferred embodiments, this is not a problem since as mentioned above error information is generated at the same frequency as positional information is generated, and all error information is broadcast in the form of error packets. Accordingly, assuming the error packets are generated in accordance with the Figure 8 approach, once the appropriate error packet has been received by the portable device at step 440 of Figure 5, the process proceeds to step 450, where a query URL is constructed based on corrected positional information. In accordance with the figure 9 approach, the portable device will have to wait at step 440 for the batch containing the

appropriate error packet, but the duration of the timer set at step 438 can be set to take account of the delay inherent in the batch process of figure 9.

Once the appropriate error packet has been received, then the positional information is corrected based on the error information in that error packet in order to produce corrected positional information. In preferred embodiments, this process is identical to that used in standard DGPS receivers to correct the positional information determined from the GPS satellite signals.

The query is then generated at step 450 based on this corrected positional information. As mentioned earlier, in preferred embodiments, a standard query is used, in which is incorporated the corrected positional information. This standard query is then transmitted over the wireless network to the server 8 at step 455, after which the process returns to step 410.

Figure 7 schematically illustrates the process performed within the server upon receipt of the query URL transmitted by the portable device 6. Again, this process may be implemented by a suitable software thread executing on the server.

At step 600, it is determined whether the query URL has been received, the process remaining at step 600 until the query URL has been received. At that point, the process then proceeds to step 610, where the query URL is processed in order to extract the positional information, after which that positional information is used to obtain the URL address associated with that positional information. As discussed earlier, this process is preferably performed with reference to a suitable look up table associating ranges of positional information with individual URL addresses.

The process then proceeds to step 620, where the URL address is transmitted to the portable device over the wireless network, the process then returning to step 600. If, at step 610, it is determined that there is no URL address in the lookup table corresponding to the positional information, then an error message is generated and transmitted at step 620 to the portable device. This will cause the portable device to indicate to the user that no information is available.

Figure 6 illustrates the process performed within the portable device upon receipt of the URL address from the server 8. Again, this process is preferably

implemented by a suitable software thread executing on the microprocessor of the portable device 6.

At step 500, it is determined whether the URL address has been received, the process remaining at step 500 until the URL address has been received. Then, the process proceeds to step 510, where it is determined whether that URL address is "new". It will be appreciated that there are a number of different ways in which this decision may be implemented. For example, the portable device may be arranged to determine whether the URL address differs to the URL address for the block of information currently being output on the display of the portable device. If the URL address is the same as that of the block of information currently being displayed, the process returns to step 500. Alternatively, the portable device may be arranged to cache a number of previous URL addresses, and the blocks of information associated therewith. In this embodiment, the portable device may be arranged at step 510 to determine whether the URL address is the same as any of the cached URL addresses. If it is, then again the process returns to step 500 since the block of information is already cached within the portable device, and hence does not need to be re-retrieved from the server. In this embodiment, it will be appreciated that the portable device may be arranged to either automatically retrieve the relevant block of information from its cache, and display that information to the user, or alternatively may prompt the user to indicate whether he/she wishes that information to be displayed.

Assuming at step 510 it is determined that the URL address is indeed a new URL address, then the process proceeds to step 520, where a request for the web page is transmitted over the wireless network to the server 8. In preferred embodiments, this is achieved by causing the web browser to initiate a request for the web page specified by the URL. Hence, at this point, a standard request for a web page has been transmitted, and the server will act accordingly using standard Internet technology to cause the relevant web page to be retrieved and transmitted to the portable device for display to the user. Once the web page request has been transmitted at step 520, then the process of Figure 6 returns to step 500 to await receipt of a subsequent URL address from the server.

Although a particular embodiment of the invention has been described herewith, it will be apparent that the invention is not limited thereto, and that many modifications and additions may be made within the scope of the invention. For example, various combinations of the features of the following dependent claims could be made with the features of the independent claims without departing from the scope of the present invention.

CLAIMS

1. A system for distributing to a portable device via a wireless network information relating to a subject of interest based on a location of the portable device, comprising:

a server for communicating with a portable device over the wireless network;

a portable device having a receiver for receiving from a terrestrial positioning system signals specifying positional information for the portable device;

the portable device being arranged to generate a query incorporating the positional information and to transmit the query to the server over the wireless network; and

the server being arranged to determine from the positional information in the query an address for a block of information relating to a subject of interest associated with that positional information, whereby the block of information can be retrieved and transmitted to the portable device over the wireless network.

2. A system as claimed in Claim 1, wherein the server is arranged to transmit the address to the portable device, the portable device being arranged to apply predetermined criteria to determine whether to request the block of information identified by the address, and the server being arranged to be responsive to the portable device requesting the block of information to cause the block of information to be retrieved and transmitted to the portable device.

3. A system as claimed in Claim 1 or Claim 2, wherein the query is constructed as a URL query, the address is a URL address for an Internet web page, the portable device is arranged to support a web browser, and the server is arranged to transmit data to the portable device to enable the web page to be displayed via the web browser.

4. A system as claimed in any preceding claim, wherein the portable device has an interface for communicating over the wireless network with the server via a first wireless communication, and the signals from the terrestrial positioning system are arranged to be received by the receiver via a second wireless communication.

5. A system as claimed in any preceding claim, wherein the terrestrial positioning system is a Global Positioning System (GPS), and the receiver of the portable device is a GPS receiver arranged to determine the positional information from the received signals.

6. A system as claimed in Claim 5, wherein the terrestrial positioning system includes a differential GPS device arranged to receive the signals specifying positional information and to compare the positional information determined from those signals with an absolute position for said differential GPS device in order to generate error information, the portable device being arranged to receive the error information, and to use the error information to correct the positional information determined from the received signals prior to the generation of the query by the portable device.

7. A system as claimed in Claim 6, wherein the server is arranged to be coupled to the differential GPS device to receive the error information generated by the differential GPS device, the server being arranged to generate an error packet containing the error information and to broadcast the error packet over the wireless network for receipt by the portable device.

8. A system as claimed in Claim 7, wherein the server is arranged to generate and broadcast an error packet each time an item of error information is received from the differential GPS device.

9. A system as claimed in Claim 7, wherein the server is arranged to wait until a number of items of error information have been received from the differential GPS

device, and to then broadcast in one batch a corresponding number of error packets over the wireless network.

10. A system as claimed in any preceding claim, wherein the wireless network is a Wireless LAN network.

11. A system as claimed in any preceding claim, further comprising a lookup table accessible by the server, the lookup table containing a number of addresses for blocks of information, and each address being associated with a range of positional information.

12. A system as claimed in Claim 11, wherein if the positional information determined by the server from the query is not associated with one of said addresses in the lookup table, the server is arranged to cause a signal to be transmitted to the portable device indicating that no block of information is available.

13. A system as claimed in any preceding claim, wherein the portable device is arranged to generate a query at predetermined intervals based on most recent positional information determined from the received signals.

14. A system as claimed in any preceding claim, wherein the portable device is arranged to generate a query when indicated by a user of the portable device, the query being based on the most recent positional information determined from the received signals.

15. A portable device for receiving via a wireless network information relating to a subject of interest based on a location of the portable device, comprising:

a controller for controlling the operation of the portable device;

an output mechanism for outputting information to a user of the portable device;

a receiver for receiving from a terrestrial positioning system signals specifying positional information for the portable device;

the controller being arranged to generate a query incorporating the positional information and to cause the query to be transmitted to a server via the wireless network; and

the controller further being arranged, upon receipt from the server via the wireless network of a block of information relating to a subject of interest associated with that positional information, to cause the information to be output to a user via the output mechanism.

16. A portable device as claimed in Claim 15, wherein prior to receiving the block of information from the server, the portable device is arranged to receive from the server an address for the block of information and to apply predetermined criteria to determine whether to request the block of information identified by the address.

17. A portable device as claimed in Claim 16, wherein the predetermined criteria is such that the portable device is arranged to request the block of information indicated by the address if the address differs to that of current information being output via the output mechanism.

18. A portable device as claimed in any of claims 15 to 17, wherein the output mechanism comprises a display device to enable the information to be visually displayed to the user.

19. A portable device as claimed in Claim 18, wherein the query is constructed as a URL query, the block of information relates to an Internet web page and the portable device is arranged to support a web browser, whereby the controller is arranged upon receipt of the block of information from the server to cause the web page to be displayed on the display device via the web browser.

20. A portable device as claimed in any of claims 15 to 19, further comprising an input mechanism for enabling the user to interact with the portable device, whereby the user can indicate to the controller via the input mechanism that a query should be submitted to the server, the controller being responsive to such indication to generate a query based on the most recent positional information determined from the received signals.

21. A method of distributing to a portable device within a wireless network information relating to a subject of interest based on a location of the portable device, a server being provided for communicating with a portable device over the wireless network, the method comprising the steps of:

(i) receiving at the portable device from a terrestrial positioning system signals specifying positional information for the portable device;

(ii) generating at the portable device a query incorporating the positional information;

(iii) transmitting the query to the server over the wireless network; and

(iv) determining at the server from the positional information in the query an address for a block of information relating to a subject of interest associated with that positional information;

whereby the block of information can be retrieved and transmitted to the portable device over the wireless network.

22. A method of operating a portable device to receive via a wireless network information relating to a subject of interest based on a location of the portable device, comprising the steps of:

(i) receiving from a terrestrial positioning system signals specifying positional information for the portable device;

(ii) generating a query incorporating the positional information;

(iii) transmitting the query to a server via the wireless network; and

(iv) upon receipt from the server via the wireless network of a block of information relating to a subject of interest associated with that positional information, outputting the information to a user via an output mechanism provided by the portable device.

23. A computer program for operating a portable device to receive via a wireless network information relating to a subject of interest based on a location of the portable device. the computer program being configurable in operation to cause the portable device to perform the steps of:

(i) receiving from a terrestrial positioning system signals specifying positional information for the portable device;

(ii) generating a query incorporating the positional information;

(iii) transmitting the query to a server via the wireless network; and

(iv) upon receipt from the server via the wireless network of a block of information relating to a subject of interest associated with that positional information, outputting the information to a user via an output mechanism provided by the portable device.

24. A computer program product comprising a recordable medium having recorded thereon a computer program according to Claim 23.

25. A module for adapting a device for use as a portable device in a system as claimed in any of claims 1 to 14, comprising:

a receiver for receiving from a terrestrial positioning system signals specifying positional information for the portable device; and

a wireless interface for communicating with the wireless network to enable a query incorporating the positional information to be transmitted to a server via the wireless network, and to enable receipt from the server via the wireless network of a block of information relating to a subject of interest associated with that positional information.

26. A system for distributing to a portable device via a wireless network information relating to a subject of interest based on a location of the portable device, substantially as hereinbefore described with reference to the accompanying drawings.

27. A portable device for receiving via a wireless network information relating to a subject of interest based on a location of the portable device, substantially as hereinbefore described with reference to the accompanying drawings.

28. A method of distributing to a portable device within a wireless network information relating to a subject of interest based on a location of the portable device, substantially as hereinbefore described with reference to the accompanying drawings.

29. A method of operating a portable device to receive via a wireless network information relating to a subject of interest based on a location of the portable device, substantially as hereinbefore described with reference to the accompanying drawings.

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Application No: GB 9926633.0 **Examiner:** Anita Keogh
Claims searched: 1-24 **Date of search:** 9 May 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4L (LDGX, LDPP, LDSL, LERM, LESF)

Int Cl (Ed.7): G01S (5/00, 5/14), H04Q (7/22, 7/38)

Other: Online: WPI, JAPIO, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X, Y	WO 99/56144 A1	(SNAPTRACK) see whole document	X:1, 3, 5 15, 18, 20-23 at least Y: 6-9
X, Y	WO 98/59506 A2	(TELIA) see whole document, especially page 2 lines 7-15 & 26-28, page 5 lines 1-4	X: 1, 5, 11, 14, 15, 18, 20-24 at least Y: 6-9
X	EP 0919787 A1	(MITSUMI ELECTRIC) see whole document especially column 2 lines 46-48 and column 3 lines 16-21	1, 4, 5, 15, 21, 22 at least
X	JP 110272687 A	(SONY) see online abstract and figures	1, 3, 15, 18, 19, 21-22 at least
X	JP 110072348 A	(SEIKO) see online abstract and figures	1, 5-7, 15, 21-22 at least
X	JP 100013961 A	(FUJITSU) see online abstract and figures	1, 3, 15, 18, 19, 21-22 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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Application No: GB 9926633.0 **Examiner:** Anita Keogh
Claims searched: 1-24 **Date of search:** 9 May 2000

Category	Identity of document and relevant passage	Relevant to claims
Y	JP 090311177 A (SEIKO) see online abstract and figures	6-9

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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